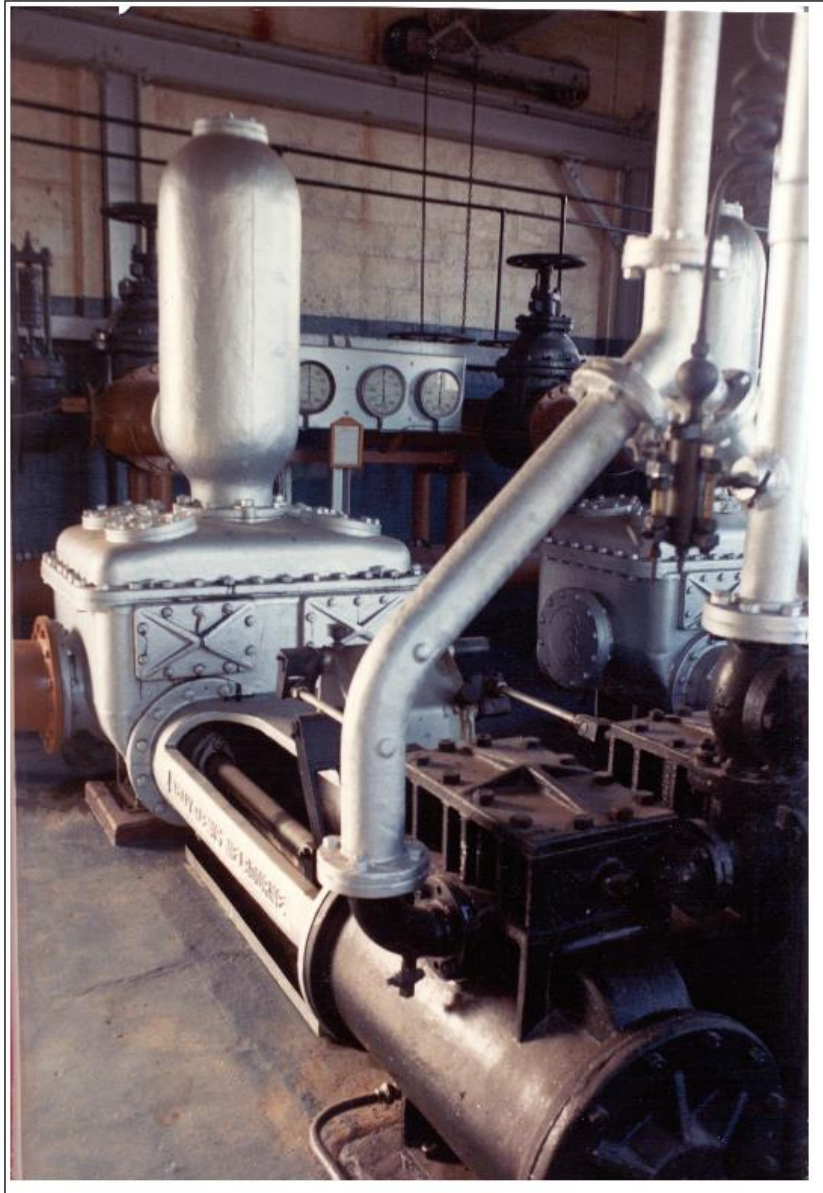


STEAM PUMP HOUSE STOKES HILL



PETER DERMOUDY

STEAM PUMP HOUSE

STOKES HILL

DARWIN

A REPORT FOR THE NORTHERN TERRITORY
POWER AND WATER AUTHORITY

PETER DERMOUDY

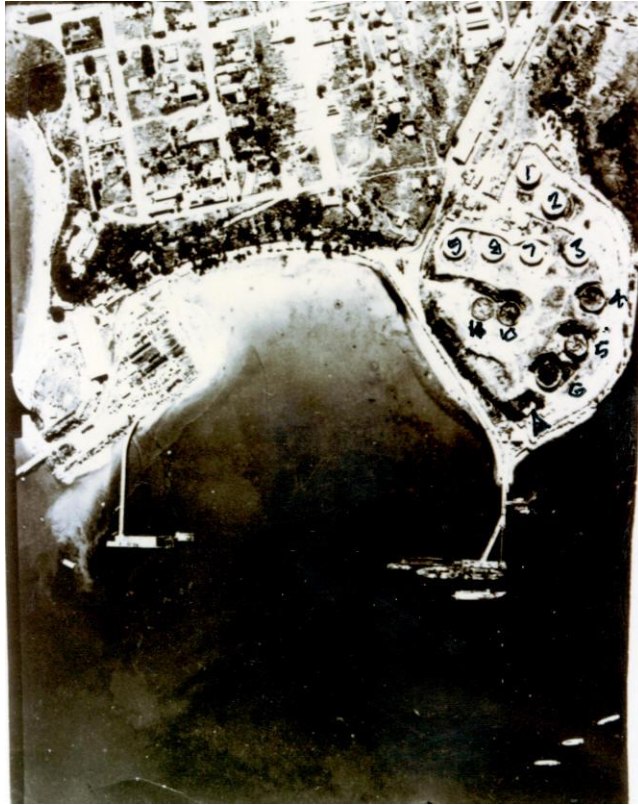
52 TEMIRA CRESCENT
DARWIN

GPO BOX 1573
DARWIN 0801

PHONE: 812 845???????

APRIL 1989

STEAM PUMP HOUSE – STOKES HILL



*Steam Pump House south of
destroyed Tank No. 6*

From June 1884 when the first Japanese pearl divers arrived in Darwin, a certain sense of vulnerability to attack from “The North” has pervaded the minds of Australian defence strategists.

This fear was also felt by the British, who had their colonial interests and who kept a parental eye on their “outpost”. Numerous intelligence reports and assessments of Australia’s defence capability were prepared by the British for their own benefit and indirectly for influencing the Australian Government.

One such assessment by Field Marshall Viscount Kitchener, in 1911, stated that Darwin had only one strategical advantage. It was a capable landing place.

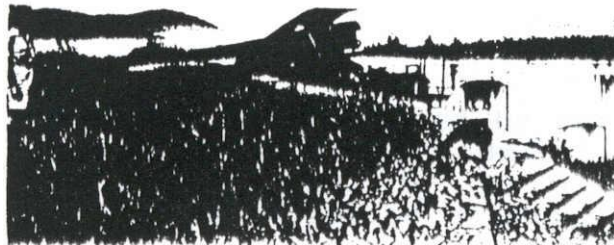
A Naval Reserve District was declared for Darwin on 1911 and manned by a crew of three.

This defence force was added to in World War I by the formation of a volunteer machine gun unit – the Cable Guard, whose responsibility was to guard the cable station and Submarine cable which linked Australia to Singapore and places west.

British Naval strategist, Viscount Jellicoe, in 1919 mooted Darwin as one of three Australian sub bases for a large Far Eastern Naval Fleet which would have Singapore as its main base. His plan was rejected as over reactive and far too expensive for either Britain or Australia to undertake.

The Secretary of the Department of the Navy in a 7 September 1920 memo to the Secretary, Department of Defence, felt that coastal defences for the N.T. were not necessary. Thursday Island, a coaling station and sentinel in the straits between Australia and New Guinea, was still high on his strategical list.

Thursday Island had been a defended coaling station since 1891 in preparation for an expected Russian invasion. Armaments had been provided by the British Government and consisted of three six inch (150mm) breech loading guns and 9 pounder rifle muzzle loading guns.



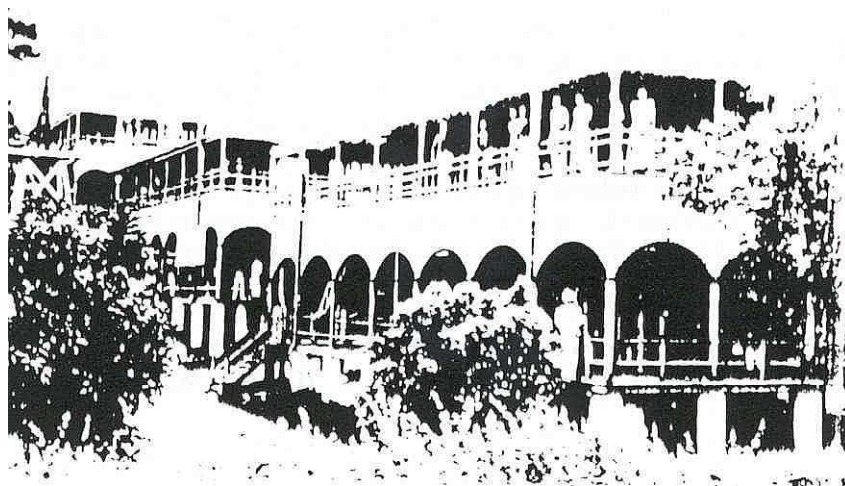
The manufacturer's date of 1808 can still be seen on the now abandoned six inch guns. The Fort was manned originally by two officers and men of the Queensland Permanent Artillery who lived in two storied timber framed barracks.

Jellicoe's 1919 plan was finally reduced, during the 1923 Imperial Conference, to delete all thoughts of an independent Far Eastern Naval Fleet in favour of relying on a fortified Singapore base to be kept on readiness to receive a quickly despatched British Fleet should a problem arise, Australia and New Zealand, were to look after minor problems such as landings and minor invasions themselves until the might of England could be brought to bear on the adversary.

To this end a refuelling depot to service the British Fleet was to be established in the Darwin Area (Bynoe Harbour was the suggested site but rejected by the Australian Government on economic grounds).

The 1923 Singapore decision and the switch by the Navy from coal to oil fuel led to the eventual closure of the Thursday Island Naval Installations. This swing began in 1924 with the construction of a series of oil storage tanks in Darwin and the foreseen need to defend them.

Over the period 1932-33 the island's barracks were partially dismantled by a party of Australian Engineers for reuse in Darwin in the construction of fortresses and allied barracks at Emery Point, East Point and Myilly Terrace.



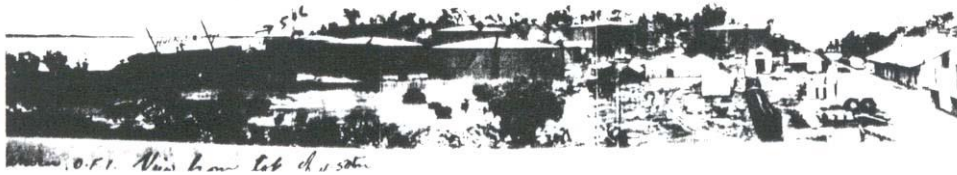
*Thursday Island Barracks
before dismantling began*

Four tanks had been completed and filled by October 1929 as part of a five year plan proposed by Admiral Sir Reginald Henderson, Royal Navy, in response to the Australian Government's request for him to advise of Naval Strength and preparedness.

In 1927 the Navy still considered Darwin to be a low risk and estimated that the Garrison with 20-30 men to maintain the 2 x 9.2 inch and 2 x 6 inch guns in peacetime would be enough to put up a fight in a surprise raid. (Extract from R.C. Handcock R.N. 15/6/27).

The actual siting of the tanks behind Stokes Hill was believed in the first instance to be protection from naval bombardment from harbour approaches and a battery of coastal guns located on the harbour entrance would be the ultimate defence.

Apparently nothing had been learnt of the dangers of aerial warfare from World War I.



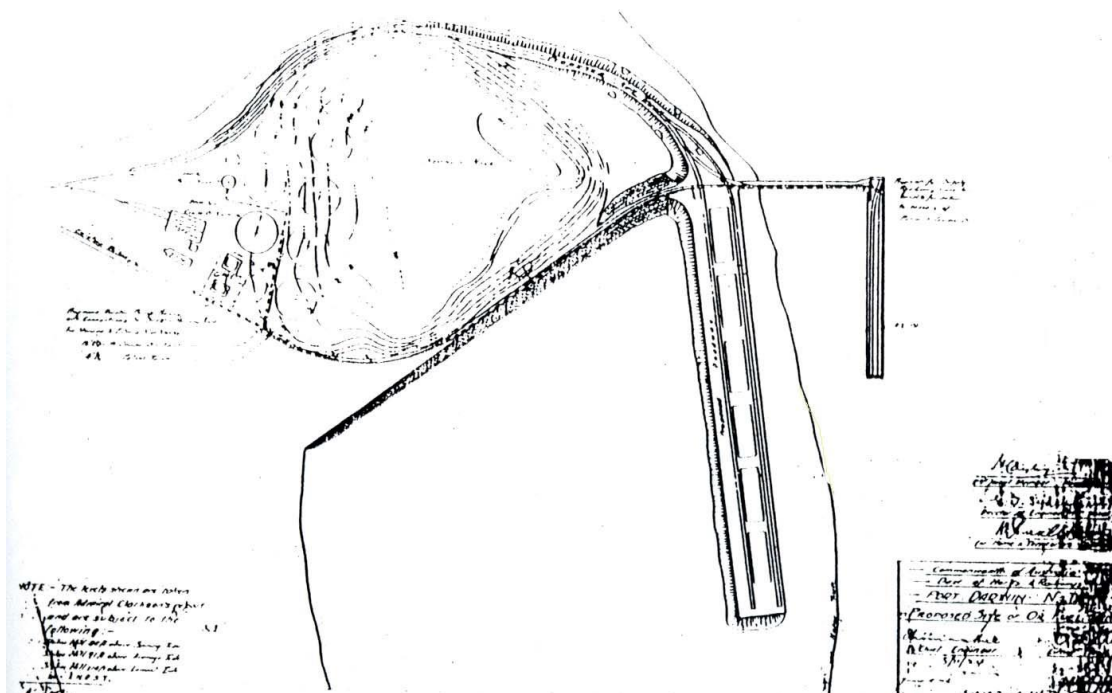
1938 View of Oil Fuel Installation

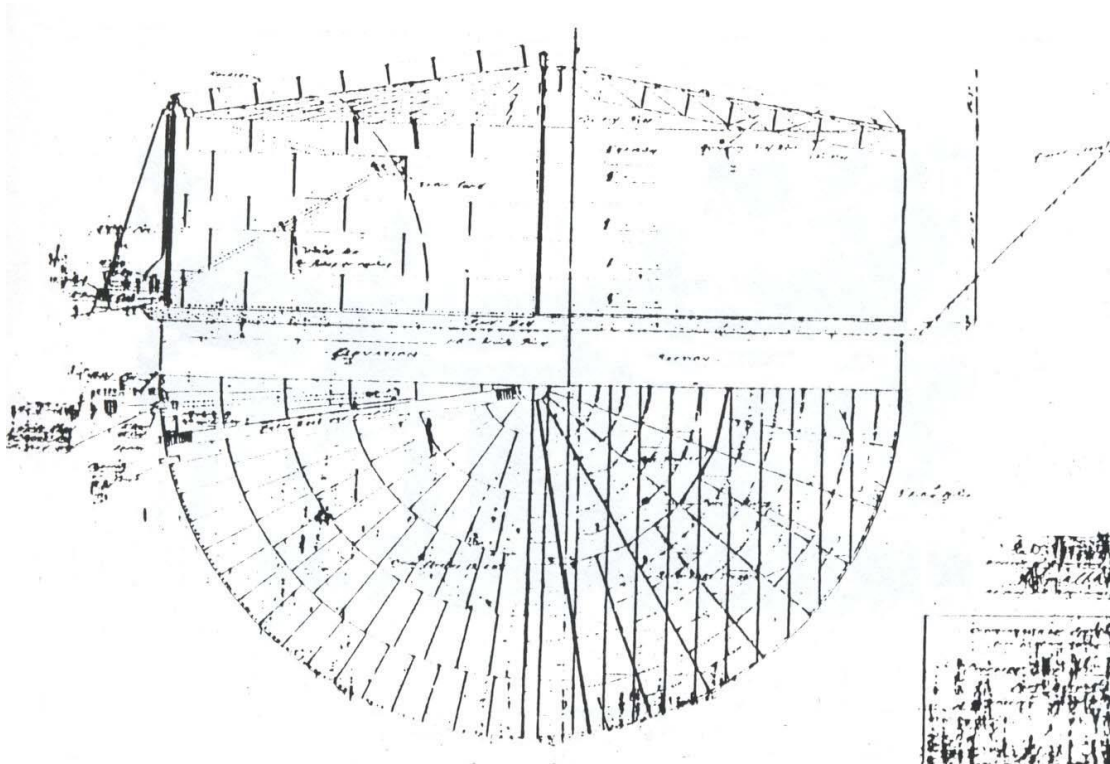
In the period between 1919-1926 four separate consultants were engaged to prepare development schemes for the Stokes Hill area from the railway yards to the wharf.

The first, in 1919, was J. Riseley Settle, Director of Navel Works, followed by Engineer Vice Admiral Sir William Clarkson RAN, then J. Ramsbotham, Director of lighthouses and finally, in 1926, Sir George Buchanan. The latter's Scheme "B" included an area set aside for oil storage tanks on the northern side of Stokes Hill.

Clarkson's input is not entirely understood but his report is clearly alluded to in an early drawing prepared by the Commonwealth Department of Works and Railways in November 1924.

This drawing shows one 8,000 ton oil tank and one 450 ton petrol tank drawn with firm lines and eight tanks drawn with broken lines.





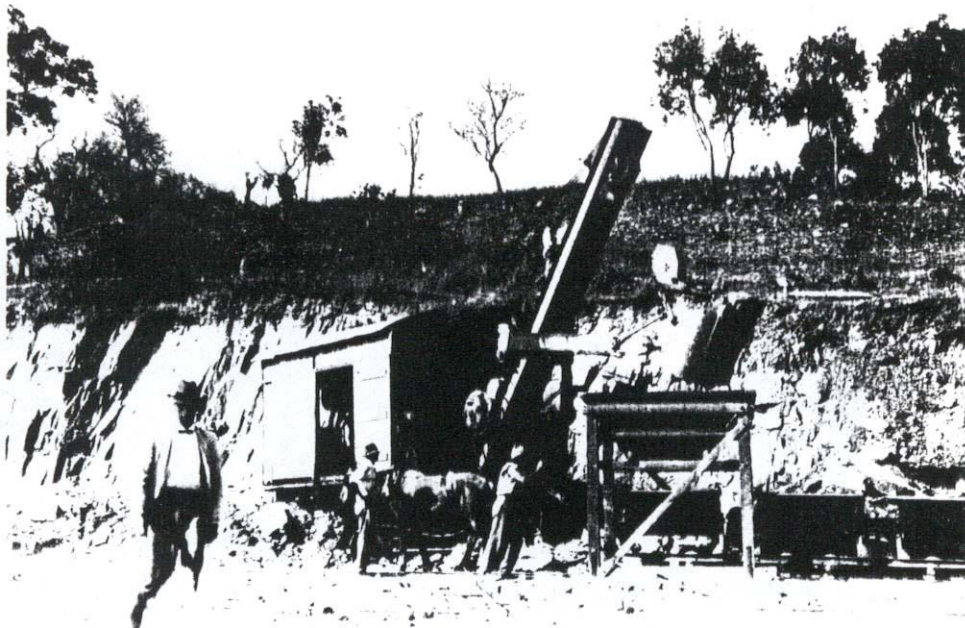
The 8,000 ton (8,128 tonne) tanks as designed at the time were to be 35.36m diameter by 9.14m high of riveted steel construction.

Obviously detail changes were made to the final layout of the tanks before a start was made on excavations in early 1926.

Four tanks were initially planned beginning with No. 1 closest to the railway yards (and the most northern) with Nos. 2, 3 and 4 progressing in a clockwise direction around the base of the fill.

No. 3 tank was almost directly in line with the ex Naval hulk "Warrego" which had been blow ashore in 1918.



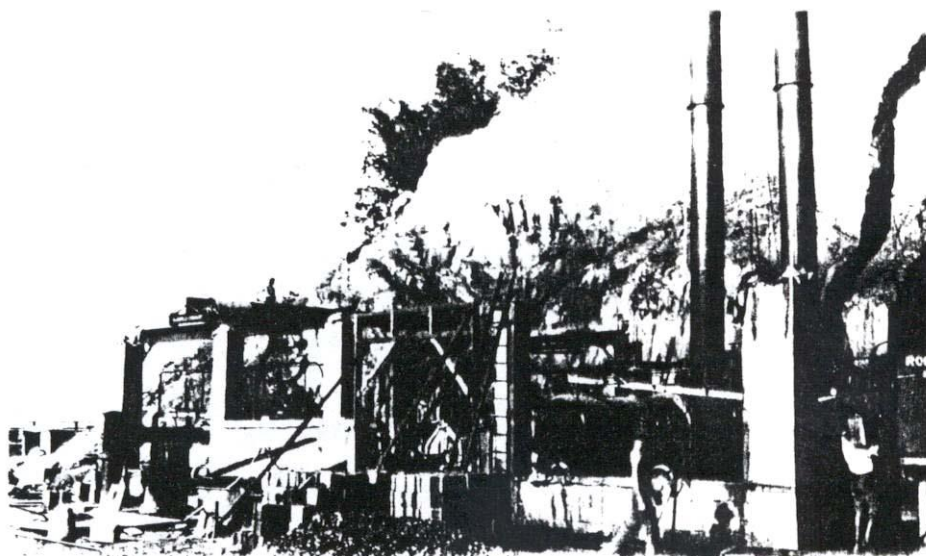


*Ruston mechanical shovel excavating for Tank No. 3 on 22 August 1927
NT Museum col. PF4*

Excavations for pipelines and the construction of a pumping station to transfer fuel between ships and tanks also had to be carried out to complete the installation.

Work began on the Steam Pump House, SITE 12, in late 1927 and was completed ready for testing the two boilers and the two main steam pumps about March 1928.

The first real task was to fill the completed Tank No. 1 with 7,896 tonnes of Borneo oil from the tanker "War Krishna" on 16 July 1928. Barely three weeks later, on 4 August, Tank No. 2 was filled from the same ship.



Building Steam Pump House. 27 January 1928. N.T. Museum col. PF7



Labour intensive site works of the day. Museum PF3.

Twelve months were to pass before Tank No 3 was ready, 12 August 1929 and a further two months before No. 4 was ready on 16 October. The 450 ton petrol tank in the railway yard was completed in 1928 but not filled immediately. (OFI Register).

With the tanks installed strategists called for their protection and men were brought from the Garrison on Thursday Island, with timber from demolished barracks and the last of the Island's coal. Their task was to build 6 inch gun batteries and search-light installations.



Excavations for oil pipe lines. Museum PF8.

By 1932 a decision was made to increase the number of tanks to nine and to re-open the Naval Reserve in 1934 under DNO Lt. Com. Jarret after twelve years of inactivity.

Tanks Nos. 5 and 6 followed on around the foreshore towards the wharf and Nos. 7, 8 and 9 formed a new line to the west from No. 3 in that order.

A tender of H. Snell and Co. for the excavation of Tanks 5 and 6 was accepted (N.S. 1 November 1932) but excavations for No. 5 were disrupted when Snell was hit on the arm and back by flying blasting debris whilst sheltering beneath his lorry. (N.S. 7 February 1933).

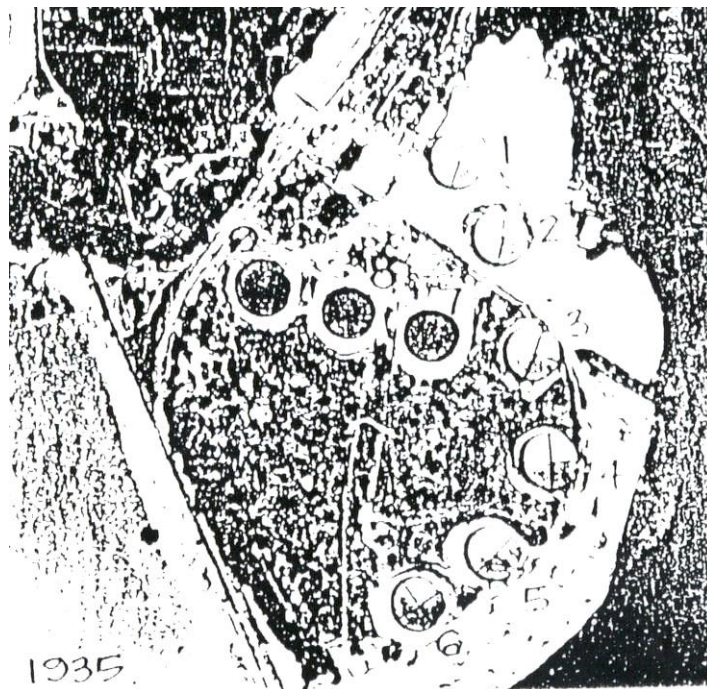
Three weeks later Paul Abala, one of Snell's men, was hit by falling rock and suffered a fractured skull, a broken collar bone and shoulder blade and three cracked ribs. Obviously no malingerer he was back at work two months later. (N.S. 25 April 1933).

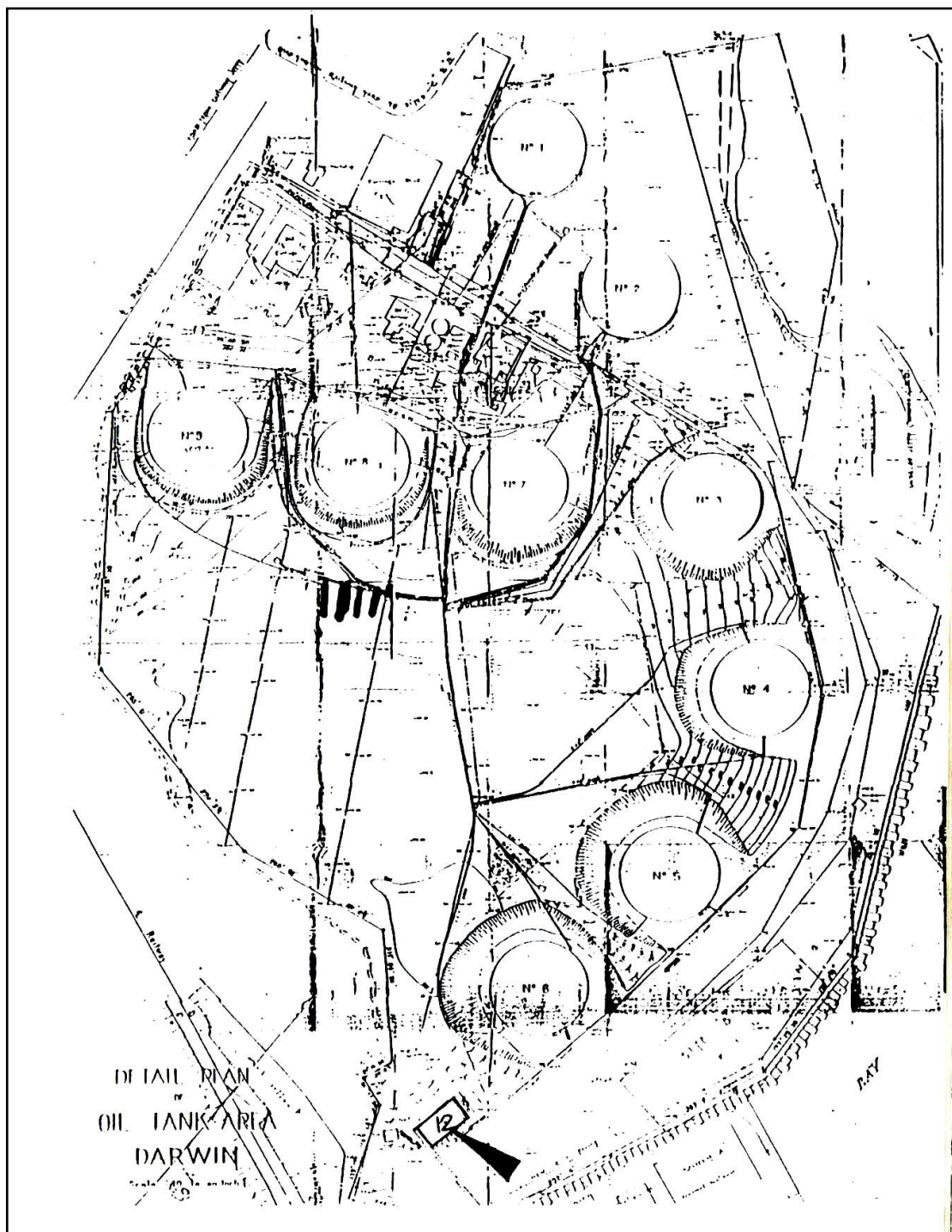
Sand bedding for both tanks was carted from below high water level from Mindil Beach.

Tank No. 5 was filled in April 1934 and No. 6 was filled in June.

A contract worth £36,859 was let to Evans Deakin and Co. Ltd. for Tanks 7, 8 and 9 which were to be electrically welded. (Commonwealth Gazette No. 72, 1 November 1934).

No time was wasted as the last tank, No. 7, was filled on 31 March 1936 from Tank No. 8 which itself had been first filled on 16 November 1935. (OFI Register)





December 1936 Detail Plan, Neg. No. 9251. Hulk of the "Warrego" is shown east of Tank No. 3. Steam Pump House shows to south west of Tank No. 6.

With war all but imminent Evans Deakin were given another contract for two more tanks, Nos. 10 and 11 for £30,778. (N.S. 12 May 1939)

Tank No. 11 was filled first on 18 November 1941 followed by No. 10 on 2 December. (OFI Register)

On 16 February 1942, the ill fated tanker "British Motorist" delivered 10,895.59 tonnes of Iranian oil to Tank No. 10. Three days later, on the 19th, two of her crew were dead and she was on the bottom of Darwin Harbour, hit twice by Japanese bombs.

Another victim of this raid was Tank No. 6 which lost 117.6 tonnes of oil (ibid.)

Notwithstanding it held enough oil to supply USAAF 800th. Engineers with 286.69 tonnes on 31 March.

This was an ill fated tank as it and Tank No. 4 were both destroyed on 15 March 1943. Tanks 1 and 2 were hit but the bombs failed to explode. Tank No. 7 and the railway yard tank were strafed.

As luck would have it Tanks 1 and 7 were empty at the time. Prior to this Tanks 10 and 11 were totally destroyed and Tanks 3 and 9 damaged in Raid No. 19 on the 16 June 1942 (ibid).

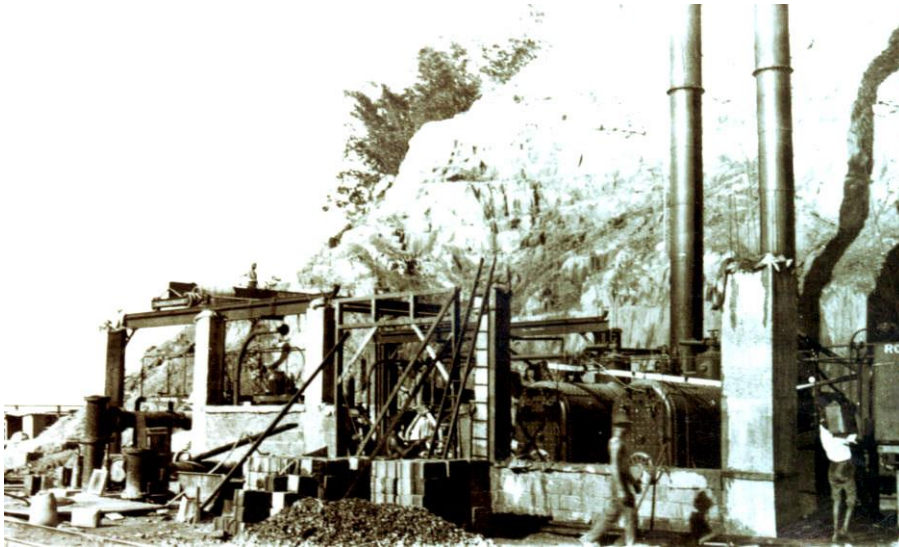


Tanks 10 and 11 totally destroyed on 16 June 1942

DETAILED BUILDING HISTORY

The building was constructed for the Royal Australian Navy under the aegis of the Commonwealth Department of Works and Railways.

Photographs indicate the early erection of the reinforced concrete columns of the building and travelling beam crane with its associated steel columns and rails. This sequence of erection allowed the installation of major mechanical equipment items such as the original twin boilers and existing twin duplex pumps to proceed before the entire restrictions of the building fabric interfered with access.



Begun in late 1927, this 31.1.28 photograph shows machinery installed before completion of walls and roof. N.T. Museum col. PF7

Infill wall panels are concrete block, bag rendered on both sides. Steel trusses are centred on the reinforced concrete columns in the location of the beam crane but land on the bond beam elsewhere for some strange reason.

Wood purlins and corrugated galvanised iron complete the roof structure. An arched ridge vent was originally fitted but has now been removed.

A lean-to roof was constructed on the north end over elevated, square, steel 1818 litre fuel tanks. Boiler fuel was drawn from the product.



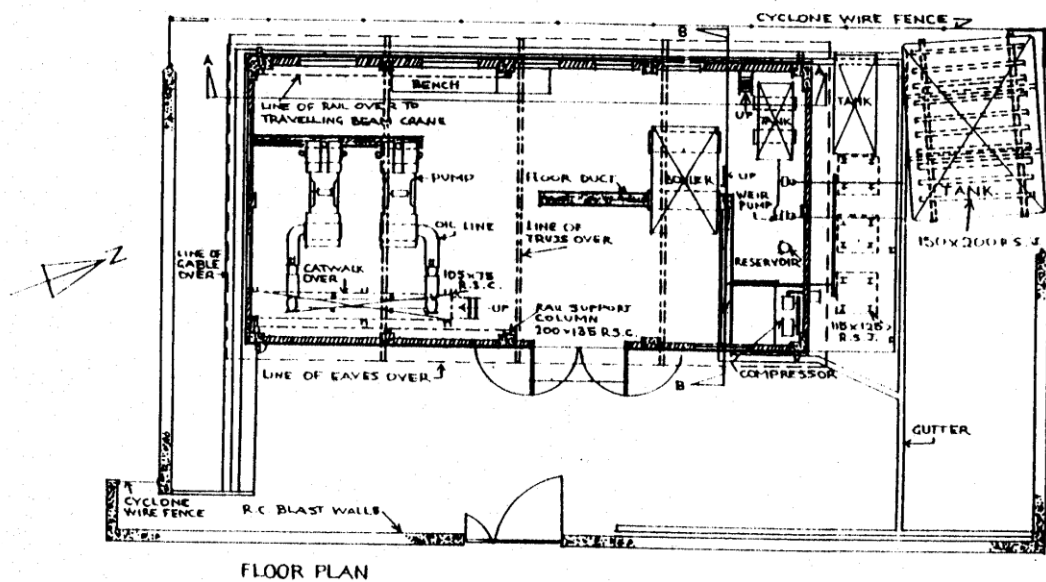
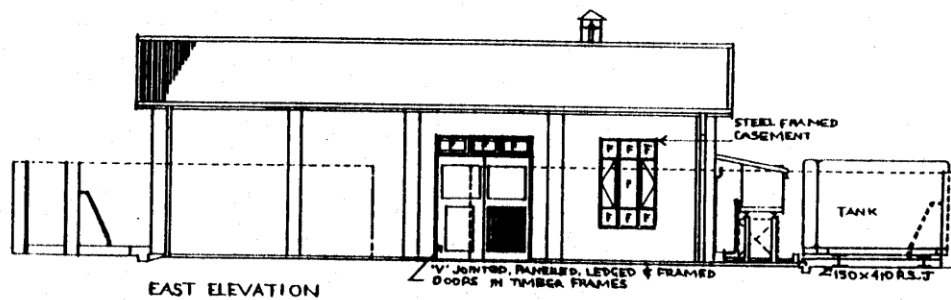
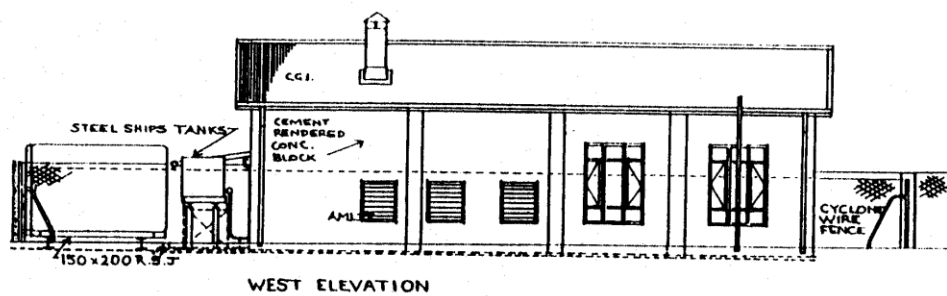
*Finishing touches being made to the building
on 23 March 1928.
N.T. Museum col PF14*

Blast walls were constructed on three sides of the building under the same contract which provided same for oil tanks Nos. 1 – 11 in 1942-43.

The apparent lack of blast wall to the west boundary and parts of the north and south boundaries is no coincidence as the original building was constructed within a quarried out insert in Stokes Hill and the blast walls finished against the hill.

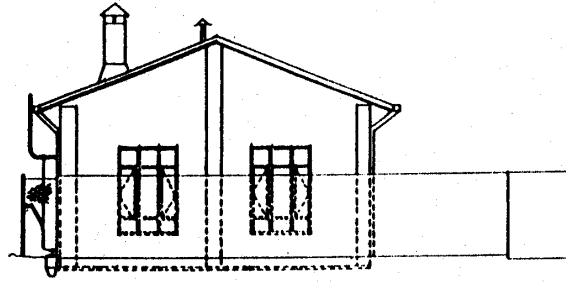
The building lacks architectural style and evidence of innovative thinking. It shows a rather ad hoc approach indicating, perhaps, a lack of detailed drawings or changes brought about on site by non delivery of certain essential materials or equipment.

The photograph shows the evident disregard of block sizes in the selection of window and door dimensions which led to unnecessary cutting of blocks and poor final detailing.

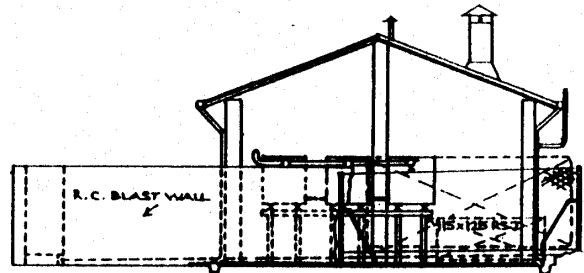


0 1 2 3
SCALE

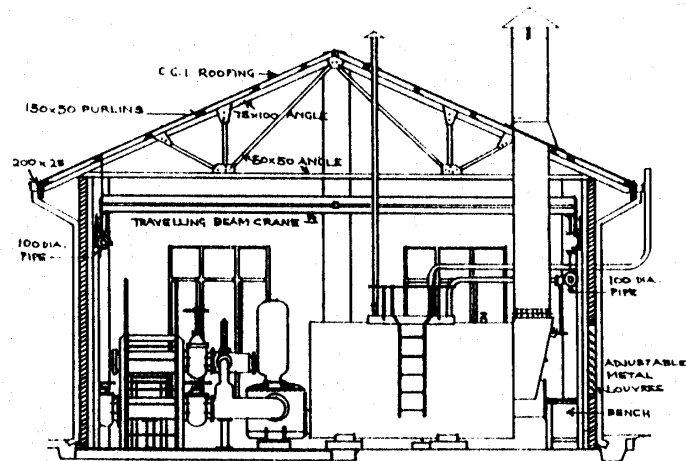
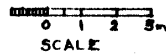
MEASURED DRAWING



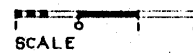
SOUTH ELEVATION



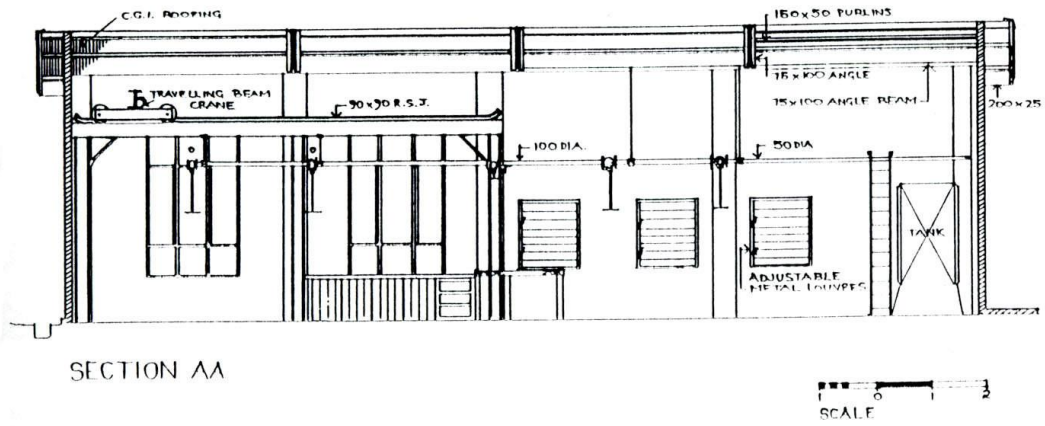
NORTH ELEVATION



SECTION BB



MEASURED DRAWING



MEASURED DRAWING



*North-eastern corner shows outline of demolished
lean-to roof. Dermoudy 3.89*



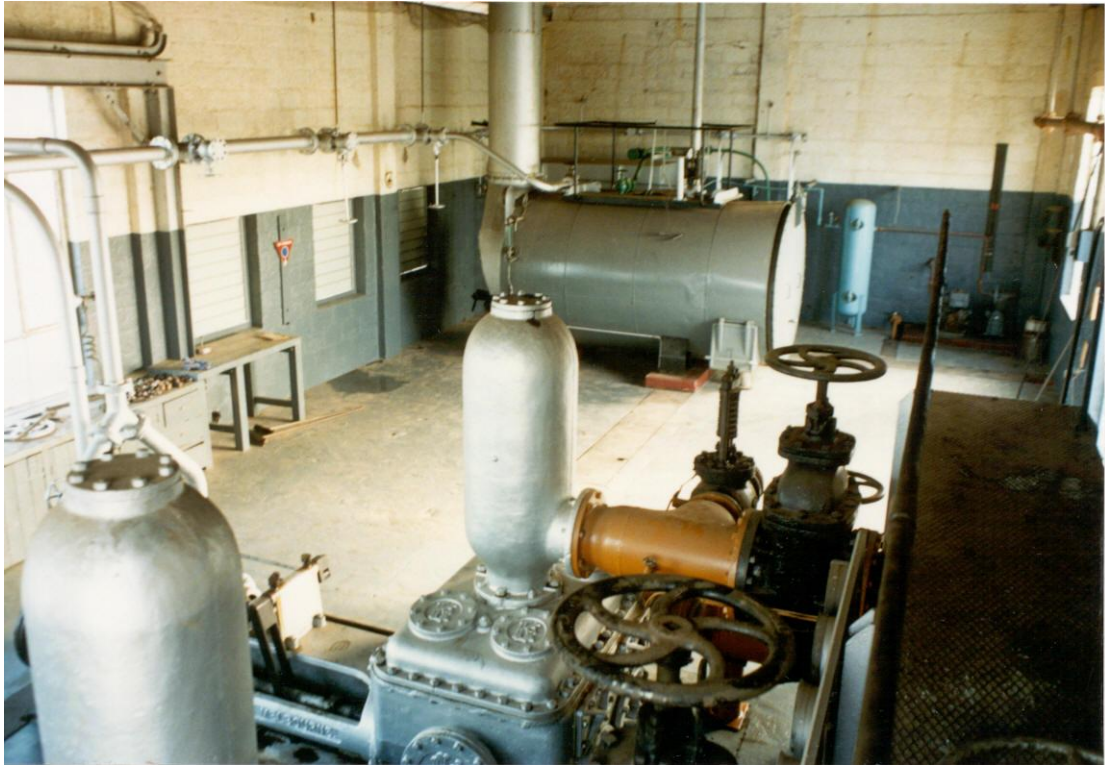
West Elevation from Stacking Yard. Dermoudy 3.89



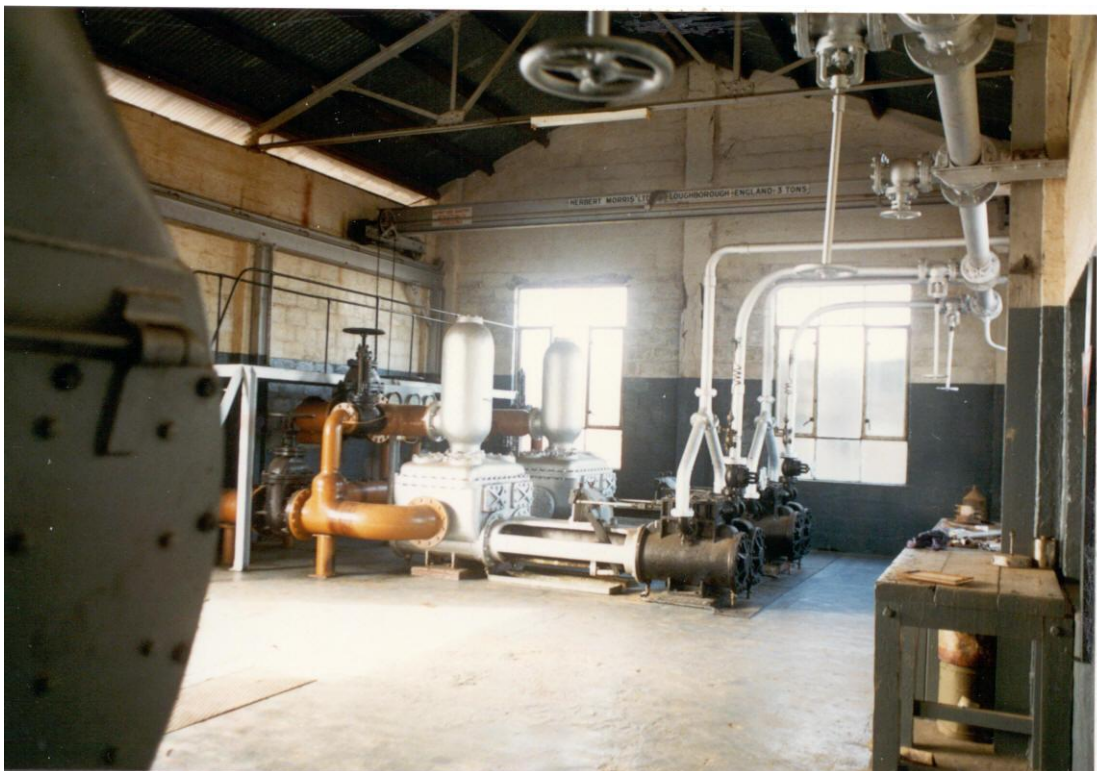
North elevation. Ships tanks and water tank from excavated hill, relic of lean-to shelter. Dermoudy 4.89



Detail of gutters. Dermoudy 4.89



Interior looking north from catwalk. Dermoudy 4.89



Interior looking south. Dermoudy 4.89

Following further excavation of Stokes Hill to form the Port Authority stacking yards in 1968/69 and 1974, security of the enveloping hill was lost and replaced with a cyclone wire fence.

The square sectional tank now located on the north end of the building was relocated from its original elevated location on Stokes Hill during the subsequent excavations.

CONDITION

Serious spalling of the reinforced concrete columns is the only apparent structural defect.

The seriousness of the defect as a reason to abandon the building is difficult to assess because the concrete block infill panels are probably quite capable of supporting the building without the columns to a certain degree.

Certainly sufficiently to allow replacement of the columns one by one without trauma to the building. Moderate rusting of steel window frames and sashes, trusses, crane components etc is controllable if taken in hand without delay.

DETAILED MACHINERY HISTORY

BOILERS

The original pair of boilers were replaced with a single scotch marine type boiler, c1963, by a “Major”, manufactured by Johnsons Tyne Foundry Pty Ltd. of South Melbourne.

Its certified capacity is notified as 60m² - 1160k with a working pressure of 689 kpa. It was last certified in good working order on 6 July 1987.

BOILER PUMPS

Two Weir brand steam operated pumps originally installed as water make-up pumps for the twin boilers still remain. These pumps are in good operating condition, presently manifolded to serve the “new” single boiler.

They were manufactured by G. & J. Weir Ltd. of Cathcart, Glasgow. No. 30243 was manufactured in 1925 and No. 31507 was manufactured in 1926.



Water tank, Weir pumps and air receiver. Dermoudy 4.89



Detail of 1925 WEIR pump. Dermoudy 4.89

LISTER DIESEL

The present (1989), two cylinder Lister Model HDA No. 3370 ST 150 diesel replaced a single cylinder engine of like made in 1971/72 (Pers. Com. Barry Munt). The diesel engine drives a Broomwade two cylinder air compressor to provide atomising air for the boiler's oil burner until a sufficient head of steam is raised to operate a steam injected blower which takes over and allows the diesel engine to be stopped.

The engine, compressor and air receiver are sound.

KELLY AND LEWIS 15 INCH DUPLEX STEAM DRIVEN OIL PUMPS

Two pumps and various accessories were supplied to the Department of Works and Railways in 1927 under Work Order 101419.

Messrs. Thompson, Kelley and Lewis were able to supply drawings, spares, tools and parts lists which comprised that order.



Overhead view of the two duplex pumps. Dermoudy 4.89

The pumps were tested in March 1928 and completed their first task on 16 July 1928 when they pumped 7,896 tonnes of Borneo Oil into Tank No. 1 from the tanker War Krishna.

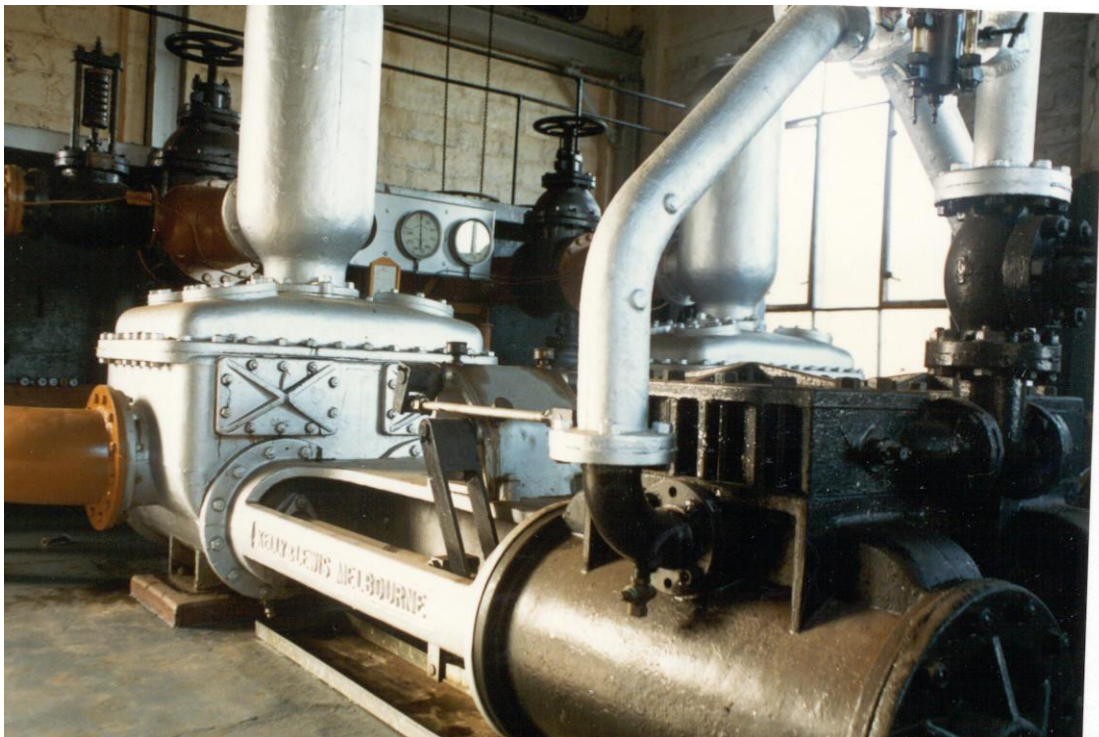
They then operated on a full time basis up until the end of WW11 when their duty was periodically taken over by an electric pump installed in the new pump chamber of Nos. 10 and 11 Safe Oil Storage Tunnels.

Apart from periodic testing the last time they worked was when the electric pumps failed whilst refuelling HMS Britannia on 16 – 18 March 1963 and the system had to fall back onto steam power.

The pumps were finally disconnected from the oil lines in February/March 1989.

New electric pumps in the OFI and the “old” one in the tunnels now carry on the task.

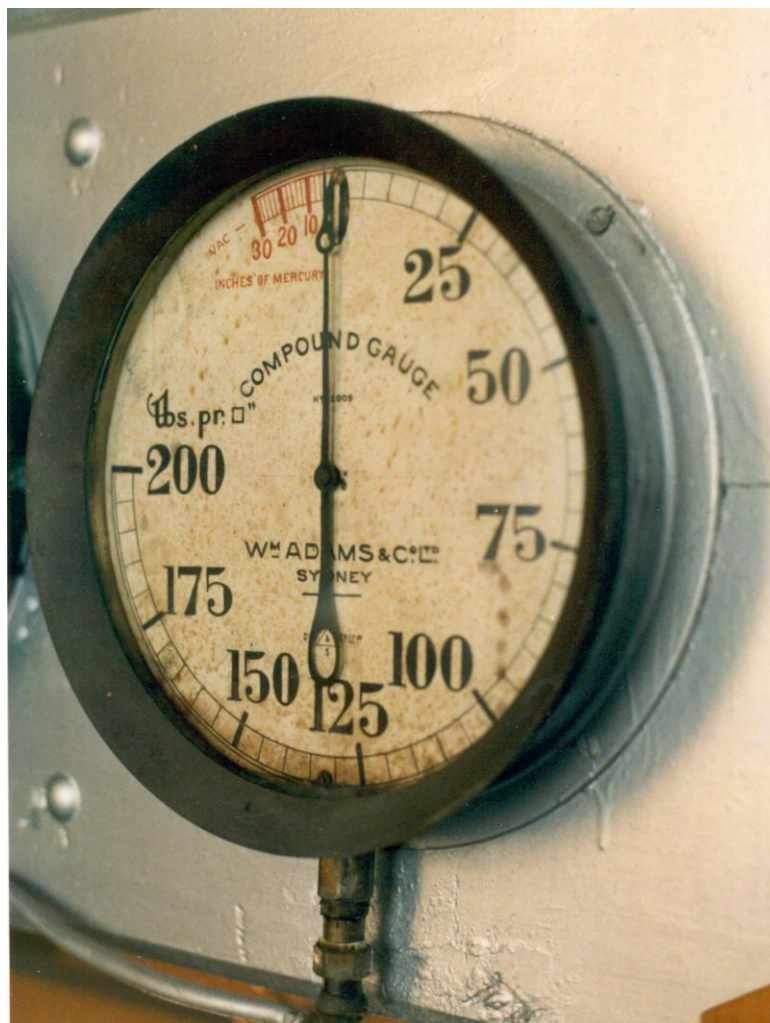
The pumps when last tested on 6 July 1989 were in good order.



Derham 4.89



Detail of pumps and gauge. Dermoudy 4.89



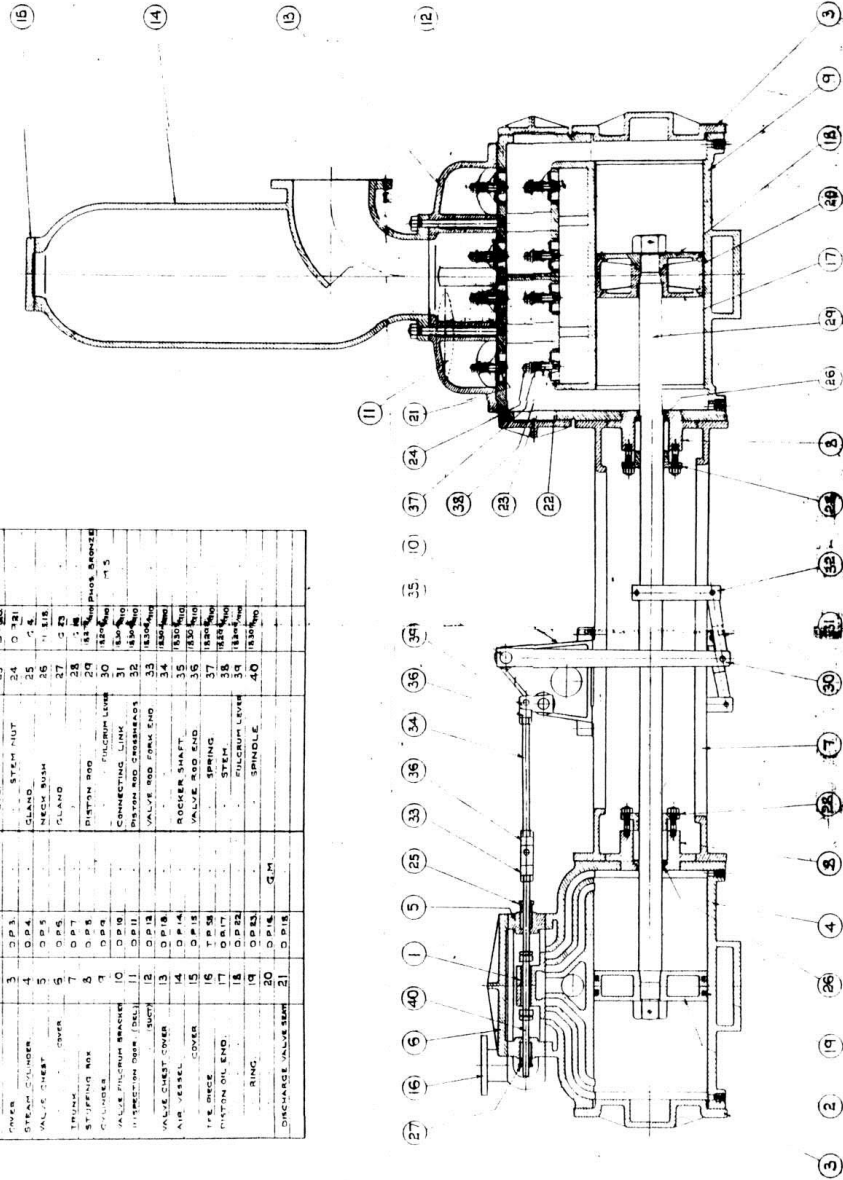
SCALE $\frac{1}{4}$ = 1 FOOT.



ARR. OF STEAM DRIVEN DUPLEX OIL PUMP.

SCALE 1/4" = 1 FOOT.

PART	ITEM NO.	MATERIAL	PART	ITEM NO.	MATERIAL
VALVE	1	DP 1	INLET VALVE SEAT	22	DP 1
VALVE	2	DP 2	VALVE	23	DP 2
STEAM CYLINDER	3	DP 3	STEM NUT	24	DP 3
VALVE CHEST	4	DP 4	GLAND	25	DP 4
TRUNK	5	DP 5	NECK BUSH	26	DP 5
STIFFING BOX	6	DP 6	GLAND	27	DP 6
VALVE PLUGGING BRACKETS	7	DP 7	ROCKING ROD	28	DP 7
VALVE PLUGGING BRACKETS	8	DP 8	ROCKING ROD	29	DP 8
VALVE PLUGGING BRACKETS	9	DP 9	ROCKING ROD	30	DP 9
VALVE PLUGGING BRACKETS	10	DP 10	ROCKING ROD	31	DP 10
VALVE PLUGGING BRACKETS	11	DP 11	ROCKING ROD	32	DP 11
VALVE PLUGGING BRACKETS	12	DP 12	ROCKING ROD	33	DP 12
VALVE PLUGGING BRACKETS	13	DP 13	ROCKING ROD	34	DP 13
VALVE PLUGGING BRACKETS	14	DP 14	ROCKING ROD	35	DP 14
VALVE PLUGGING BRACKETS	15	DP 15	ROCKING ROD	36	DP 15
VALVE PLUGGING BRACKETS	16	DP 16	ROCKING ROD	37	DP 16
VALVE PLUGGING BRACKETS	17	DP 17	ROCKING ROD	38	DP 17
VALVE PLUGGING BRACKETS	18	DP 18	ROCKING ROD	39	DP 18
VALVE PLUGGING BRACKETS	19	DP 19	ROCKING ROD	40	DP 19
VALVE PLUGGING BRACKETS	20	DP 20	ROCKING ROD	41	DP 20
VALVE PLUGGING BRACKETS	21	DP 21	ROCKING ROD	42	DP 21



W. KELLY & LEWIS
ENGINEERS
METROUENIE

SIGNIFICANCE

This building and its contents, as an integrated unit, has high significance from a heritage and industrial technology point of view.

As part of the 1926 physical change-over of strategical refuelling bases from Thursday Island to Darwin the complex represents an important milestone in not only Darwin's history but the history of the Royal Australian Navy and the Royal Navy. It also directly led to the creation of a fortress for the first time in Darwin as part of the developing nature of Australian Defence Strategies.

An excellent opportunity to preserve a fully operational steam pump house in a location unique to Darwin's history now presents itself. It forms an important link with the Darwin waterfront, the 1926 oil tanks and World War II Safe Oil Storage Tunnels under the City.

CONSERVATION

The building and its contents should remain in-situ.

A sequential replacement of reinforced concrete columns should be made replacing reinforcing rods with galvanised rods.

Rust proofing of steel components to be carried out. Periodic running of the machinery be carried out with steam until unpractical due to boiler deterioration, thence by compressed air.

PARTS AND SPARES LIST FOR ORDER NO. 10149

1927

2 STEAM DRIVER HORIZONTAL DUPLEX OIL PUMPS
for the Dept. of Works & Railways

18230/910	D, P, 1	4 Valves (Steam)	C.I.
18228/910	D, P, 2	4 Pistons (Steam)	C.I.
18229/910	D, P, 3	8 Covers	C.I.
18243/910	D, P, 4	4 Cylinders (Steam)	C.I.
18246/910	D, P, 5	4 Valve Chasie	C.I.
18247/910	D, P, 6	4 Valve Chest Covers (Steam)	C.I.
18249/910	D, P, 7	8 Trunks	C.I.
18250/910	D, P, 8	8 Stuffing boxes	C.I.
18252/910	D, P, 9	2 Cylinders (Oil)	C.I.
18258/910	D, P, 10	2 Valve Fulcrum Brackets	C.I.
18264/910	D, P, 11	8 Inspection Doors (Delivery)	C.I.
18265/910	D, P, 12	8 Inspection Doors (section)	C.I.
18266/910	D, P, 13	2 Valve Chest Coves (Oil)	C.I.
18269/910	D, P, 14	2 Air Vessels	C.I.
18272/910	D, P, 17	4 Oil Pistons	C.I.
	X XXX		
18277/910	R, F, 58	2 Tee Pieces	C.I.
13694/426	F, F, 27	2 x 5" Blank Flanges	C.I.
18308/910	D, P, 23	8 Piston Rings	C.I.
6115/6	G, 4,	4 x 7/8" Glands (stock)	C.K.
8555/6	G, 23	4 x 3/4" Glands (stock)	C.M.
6126/6	G, 16	8 x 3" Glands	C.M.
18271/910	D, P, 16	4 x Piston Rings	G.M.
18292/910	D, P, 18	72 Valve seats (Dis.....)	G.M.
18293/910	D, P, 19	72 Valve seats (.....)	G.M.

19294/910	D, P, 20	216 Valves (Oil) 72 spares	G.K.
18295/910	D, P, 21	144 Valve stems	G.M.
7893/15	N, S, 18	8 x 3" Rack Bushes	G.M.
		144 x 5/8"	G.M.
18273/910	D, P, 24	8 x 2 1/2" Hex	Bronze
18273/910		4 Piston Rods 0 8 9 5/8" 3 1/4" Dis
18252/910		4 Oil Cylinder Liners (ordered by D.O.)	5/16 brass sheet
18297/910		2/6 Valve springs (ordered by D.O.) 72 spares	Spring steel
18296/910		144 Valve stems @ 5" of	Bright
18298/910		2 Piston Rod F Levers	
18298		2 Piston Rod Ful..... Levers	
18299/910		2 Valve Levers	
18299/910		2 Valve F..... Levers	
18300/910		4 Piston Rod C	
18299/910		4 Pins for Valve F Levers	
18301/910		4 Valve Spindles	
18302/910		2 Valve Rods as 18" of 7/8	
18302/910		2 Valve Rods as 24" of 7/8	

18303/910 .. Valve Rod Ends

18304/910 4

18305/910 4

18306/910 4 Valve

18306/910 4 Pins for

18273/910 8 Pins for Piston Rods